

Jan. 23, 1940.

J. H. NEWPORT

2,187,889

AIR CONDITIONING UNIT

Filed April 13, 1936

2 Sheets-Sheet 1

Fig. 2.

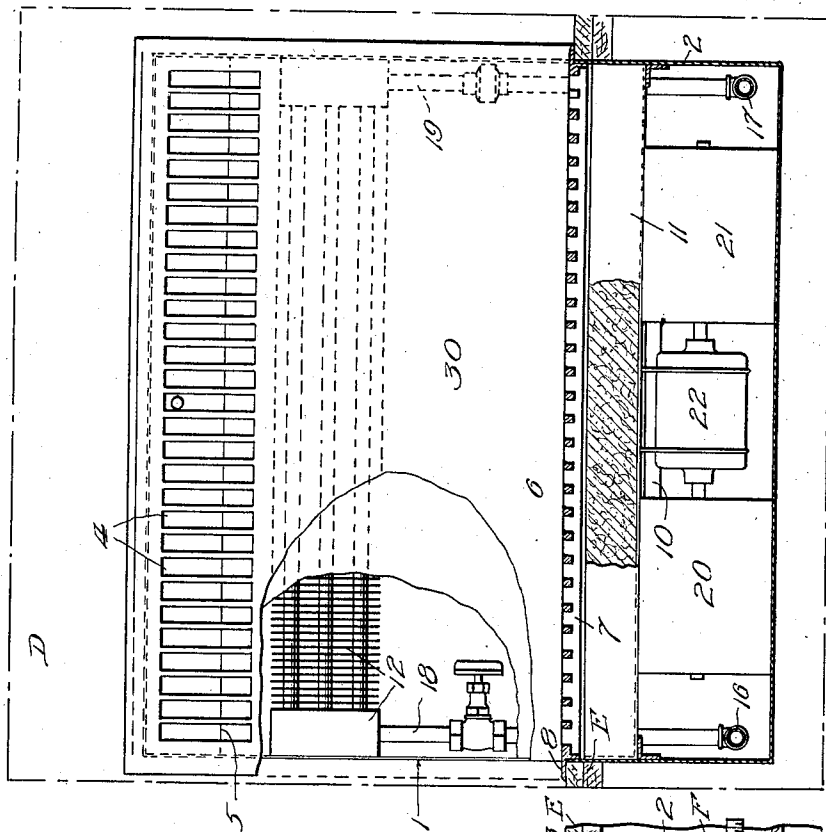


Fig. 1.

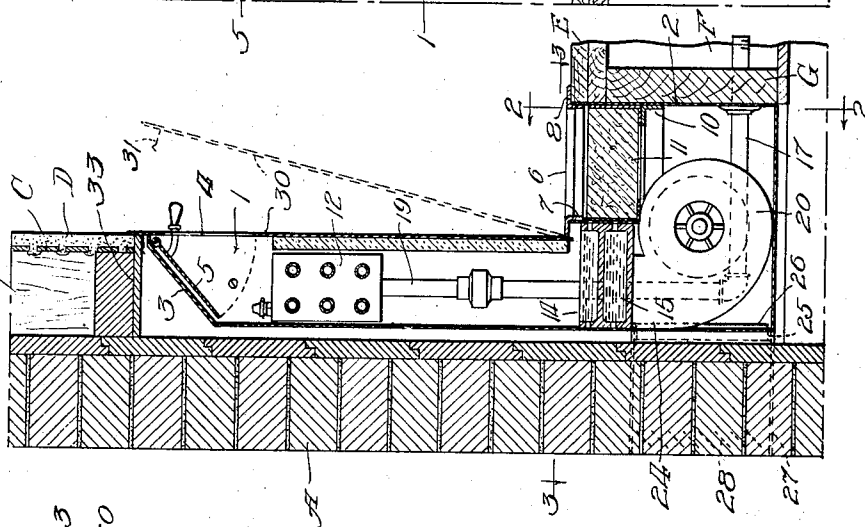
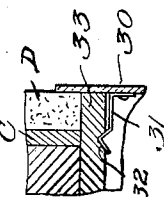


Fig. 5



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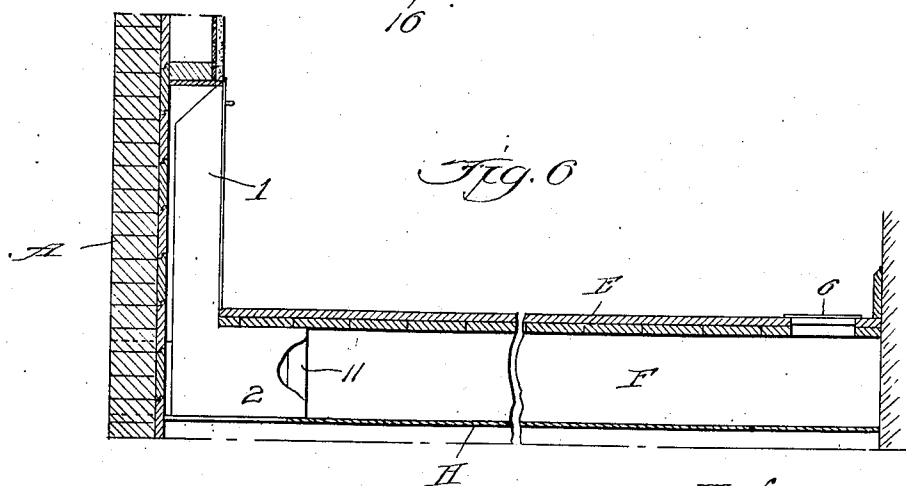
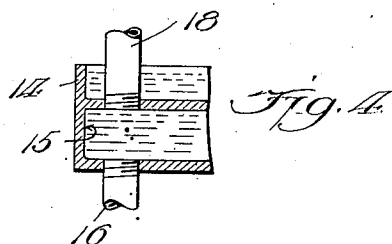
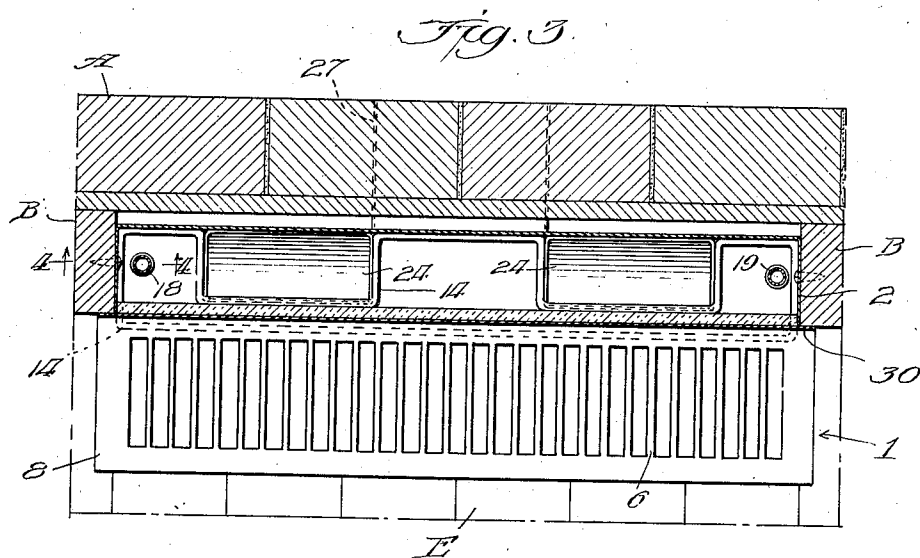
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2 Sheets-Sheet 2



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UNITED STATES PATENT OFFICE

2,187,889

AIR CONDITIONING UNIT

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Application April 13, 1936, Serial No. 74,155

2 Claims. (Cl. 257-137)

As the demand for air conditioning in homes and offices has grown, small air conditioning plants more or less suitable for this purpose have been developed. The simplest of these plants have been in the form of complete or self-contained units that may be placed in a room in the manner of an ordinary steam or hot water radiator. Just as there is now a strong demand for radiators that do not take up floor space, but are housed in the walls of the rooms which are to be heated, so, in the case of air conditioning apparatus, it will probably not be long before apparatus that takes up floor space in the room to be heated or cooled will be considered obsolete. Whereas radiators can readily be made very shallow from front to rear and thus be housed in ordinary walls, an effective air conditioning unit requires more space and must, in part at least, be considerably thicker than the width of the available space in the walls of an ordinary house or office. Therefore, where it has heretofore been desired or necessary to avoid placing a complete unit within the room, a part of the conditioning plant that could be made shallow enough was placed in the wall, and the bulkier part was placed in the basement or other space that could be used for that purpose. Obviously, where a part of the plant is in the wall and the remainder is elsewhere, the plant cannot be handled as a single unit completed in the factory or shop and requiring only to receive the proper pipe and electrical connections upon the installation of the same in the place of final use; but the different parts of the plant must be separately installed and connected by piping or air ducts, or both.

The object of the present invention is to produce a simple and compact air conditioning unit which may be manufactured, shipped and installed as a single device or piece of apparatus; and which, when installed, need occupy no space within the room to be heated or cooled and, at the same time, may effect a direct circulation of the air within the room.

A further object of the present invention may be said to be the production of a simple and novel air conditioning unit which cleans the air, controls the humidity thereof, heats or cools it, and causes it to circulate through a room or other space.

In carrying out the main object of my invention, I arrange all of the necessary apparatus within a casing which in end or edge view has the appearance of a letter L, the upper part of which is wide and high but only a few inches deep from front to rear, whereby it may be housed

within an ordinary wall; while the lower arm of the L is sunk below the level of the floor. In accordance with one method of installation, the lower part of the casing may simply be let down through a hole in the floor, which hole is then covered with a grating through which air is drawn into the unit and recirculated in the room through suitable outlets in the front wall of the upper part of the casing. Since there is plenty of available space below the floor, the height of the lower arm of the casing and its depth from front to rear may be made great enough to accommodate the most effective blower means or other air moving devices. By making the vertical height of the lower arm of the casing no greater than the depth of the floor joists, the unit may be installed in the upper floor of a house or other building without disturbing the ceiling immediately below the same. It should also be noted that when the floor joists run in the proper direction, the air need not be drawn into the unit at the base of the wall from which it is again discharged but the air inlet, through the grating, may be placed on the opposite side of the room, the space or spaces between the joists spanned by the unit serving as a tunnel to carry the air from one side of the room, underneath the floor, and to the air conditioning unit at the opposite side of the room.

The various features of novelty whereby my invention is characterized will hereinafter be pointed out with particularity in the claims; but, for a full understanding of my invention and of its objects and advantages, reference may be had to the following detailed description taken in connection with the accompanying drawings, wherein:

Figure 1 is a vertical section through a wall and an adjacent portion of the floor of a room, showing one of my improved units installed, the unit being also in section; the removable front wall of the casing being indicated in dotted lines as being swung forwardly; Fig. 2 is a section taken on line 2-2 of Fig. 1, fragments of the front wall of the upper part of the casing and of the insulation behind it being broken away to expose the interior of the casing; Fig. 3 is a section on line 3-3 of Fig. 1; Fig. 4 is a section, on a somewhat larger scale, on line 4-4 of Fig. 3, showing only the evaporating pan and the pipes connected thereto; Fig. 5 is a view, on a larger scale, but on the same plane as Fig. 1, showing only a small fragment of the casing; and Fig. 6 is a view similar to Fig. 1, but on a smaller scale with the unit shown in elevation, and il-

lustrating the manner in which the spaces between the floor joists may serve as tunnels to carry air from one side of the room to the other, underneath the floor.

Referring to the drawings, 1 and 2 represent the vertical and horizontal arms of an L-shaped casing which may conveniently be composed of sheet metal. The casing is quite wide, and the upper part or arm is of any desired height. If the unit is to be placed underneath a window, the height of the part 1, measured from the top of the lower arm or part 2 should not be substantially greater than the distance of the window from the floor. The depth of the part 1, measured from front to rear, will usually be only a few inches so that this portion of the casing may be set into readily accessible space within a wall. In a unit adapted for use in ordinary dwellings, the depth of the upper part of the casing will ordinarily be somewhat less than four inches. The length of the lower arm of the casing, that is the depth from front to rear of the part 2, may be made as great or as small as is desired, as may be its height; the main controlling factor being the space required to house the blower and one or more air conditioning devices. I have found that the lower part of the casing need not be made very deep. In a unit in which the depth of the upper part of the casing is not over four inches, the corresponding dimension of the lower part need not be more than about nine inches. I have also found that the height of the part 2 or forward extension of the casing need not be more than nine inches in the case of the unit that I have used as an illustration; thus permitting the lower part of the casing to be sunk below the floor and yet not project below the lower edges of the usual floor joists.

In Fig. 1 of the drawings, the improved unit is shown installed in a room having an outside wall A of masonry or the like, on the inner side of which are studs B to which are nailed laths C over which plaster D is spread. There is a double floor E overlying joists F in the usual way. A portion of what may be termed the inner wall, for a height and width sufficient to accommodate the casing is cut away. Since the lower portion of the casing projects forwardly from the remainder, a section of flooring, adjacent to the wall and directly in front of the recess in the latter is also cut away to permit the lower part of the unit to be dropped down through the floor. The top wall of the casing is preferably inclined downwardly and rearwardly, as indicated at 3, so that if the recess to receive the upper section or arm of the casing is bounded at the top by a window frame or the like, the casing may be eased into position without disturbing the latter. If the joists run at right angles to the wall A, it will usually be necessary to cut off one or more of them extending across the space to be occupied by the conditioning unit. In that event, the remaining free joist end or ends may be secured and supported by a cross piece G which spans the distance between and is secured to consecutive uncut joists.

The outlet from the casing is in the front wall of the section 1, close to the top, and may conveniently consist of a series of narrow, closely spaced slots 4. This outlet may be closed, if desired, by a suitable gate or damper 5. The inlet to the casing is through the top of the forward extension at the lower end of the casing; this forward extension being open over its entire length and width. Over the opening thus left in the

floor is placed a suitable protective device in the form of a grating 6 provided with a depending flange 7 that fits into the opening, and with a laterally projecting flange 8 that rests on the floor around the opening. Air may therefore be drawn from the interior of the room through the grating 6 and be forced up through the casing and back into the room through the outlet 4, after having been treated while passing through the casing.

It is advantageous to subject the air which is being circulated to three separate treatments while passing through one of the reconditioning units, namely filter it, modify its temperature, and regulate the humidity thereof. The filtering is preferably done at the entrance to the casing, so that dirt will not be carried with the air to the blowers or other air moving means. In the arrangement shown, the interior of the casing is provided with a horizontal ledge 10 at some distance below the top of the member 2, and on this ledge is set a suitable filter unit 11 that may be removed through the opening in the floor after the grating has been lifted. The air passing through the casing may be heated or cooled through contact with a suitable radiator or heat exchange device 12 in the upper part of the vertical section 1 of the casing, and the humidity of the air may be controlled by evaporating water at some point within the casing. In the arrangement shown, there is a water pan 14 extending across the casing at the juncture of the two arms thereof; the bottom wall of the pan being hollow to provide therein a chamber 15 through which a heating or cooling medium may be circulated. The pan is so shaped as to leave between the same and the rear wall of the casing spaces of sufficient cross sectional area to provide for efficient flow of air driven up from below. Water may be delivered to the pan in any suitable way. Since devices for this purpose are old and well known, I have not illustrated the same.

The heating or cooling medium is supplied by one of two pipes 16 and 17 and is returned through the other. In the arrangement shown, the pipes 16 and 17 are connected to the bottom of the chamber 15, at opposite ends of the pan. From the top of each end of the chamber 15 extends a pipe to the corresponding end of the radiator or heat exchange device 12; these pipes being indicated at 18 and 19, respectively. With this arrangement, steam or other fluid medium flowing through the supply pipe 16 passes in part through the chamber 15 to the return pipe 17 and in part directly up through the chamber 15, into the pipe 18 through the radiator, down through the pipe 19, and thence in a substantially direct downward path through the chamber 15 to the pipe 17.

In the arrangement shown, the air is moved by two blower units 20 and 21 driven directly from the shaft of a motor 22 interposed between the same; this blower unit lying in the bottom and toward the rear of the enlarged lower end of the casing. As best shown in Fig. 3, each blower casing has an outlet member 24 that extends up to or in overlapping relation with the evaporating pan; the pan being shaped to extend entirely across the interior of the casing from front to rear and from one side to the other, but having sections completely cut away to provide passages of approximately the same size and shape as the discharge outlets 24 from the blowers and in registration with such outlets.

A device as just described is adapted to draw in room air at the floor level close to a side wall

of the room and, after conditioning it, to discharge it into the room through an outlet in said wall at a higher level. Whether it be essential or not to do so, it is common to provide air conditioning units with means for taking some air from the outside atmosphere. My improved unit lends itself to this practice. If it be desired to admit outside air, it is only necessary to cut in the back wall of the casing, just behind the motor, an inlet opening bounded by a narrow flange 25 projecting outwardly from said wall. A damper 26 may control this opening, either to close it completely or to reduce its effective area to any desired extent. When it is not intended to mix outside air with the room air, this damper may be permanently closed. On the other hand, if the addition of outside air is desired, an inlet conduit, such as indicated at 27, may be inserted in the main wall A, with its inner end telescoped upon the continuous flange 25. This conduit may be provided with a damper or a set of fixed louvres 28 in or toward the outer end. When the inlet to the outer atmosphere is wholly or partially open and the apparatus is in operation, fresh air and room air may be mixed in any desired proportions, in passing through the conditioning unit.

It is important that ready access may be had to the mechanisms and devices that are housed within the casing of my improvement for purposes of inspection, regulation and repair. Upon lifting up the grating 6, the filter is exposed and, upon removing the filter, the motor and the blowers become visible and accessible. In order that the contents of the upper section of the casing may be brought into the open, I make the entire front wall of that section removable. In the arrangement shown, this front wall, indicated at 30, is simply a flat sheet or plate somewhat larger than the opening or recess in the wall of the building in which the unit is set. The lower end of the cover plate 30 is notched at the corners so that it may extend down behind the rear edge of the grating 6 and be held in place by the grating as long as the grating remains down. Suitable fastenings may be provided elsewhere on the cover plate normally to hold it in its working position. In the arrangement shown, the cover plate has on the inner side thereof, close to the top, a number of spring fingers 31 which snap into notches 32 in the top frame member 33 bounding the recess in which the unit is positioned. These fingers lock the cover plate against accidental displacement, but yield when an outward pull is applied to the top of the cover plate and allow it to be swung outwardly.

If it be desired to draw in the room air from a remote point instead of from a point directly below that to which the air is returned to the room, only a slight change need be made in the lower part of the unit. In other words, the top of the lower part 2 of the casing may be closed, the grating be placed at the inlet end of a suitable duct leading to the lower part of the casing, and the filter be relocated to adapt it to the new conditions. Ordinarily the duct will be located underneath the floor and will lead to an opening in the front wall of the part 2 of the casing.

In that case the filter may stand in a vertical position just within the front end of the lower part of the casing as shown in Fig. 6. Where the floor joists run at right angles to the wall A, as in Fig. 6, the spaces between the joists spanned by the conditioning unit, and closed at the top by the floor and at the bottom by the underlying ceiling, may be made to serve as the duct or tunnel for carrying to the unit air entering the same through the grating set into the floor at the opposite side of the room from the conditioning unit. If there be no ceiling below the joists, it is a simple matter to fasten a suitable sheathing H across the joists which are to form the side walls of the duct or tunnel, so that no special conduits or connections are required when installing a unit in such a manner that it may take in air from one side of the room, recondition it, and discharge it into the room at the opposite side.

While I have illustrated and described with particularity only a single preferred form of my invention, with a single modification, I do not desire to be limited to the exact structural details thus illustrated and described; but intend to cover all forms and arrangements which come within the definitions of my invention constituting the appended claims.

I claim:

1. In combination, a casing the upper part of which is sufficiently shallow from front to rear to permit it to be contained within the wall of a house and the lower part of which is adapted to be sunk below the level of the floor beside said wall and which is extended forwardly beyond the upper part to make it considerably deeper from front to rear than the latter, the casing having an air outlet toward the top, a grating forming the top of the forward extension of the casing and adapted to constitute a cover for the opening in the floor above the said forward extension of the casing, a horizontal filter forming a partition in the casing below the grating, a heat exchange device in the said upper part of the casing, a water evaporating device in the casing shaped to permit an upflow of air past the same, pipes for a heating or cooling fluid connected to said devices, and blower means mounted in the said lower part of the casing.

2. The combination with the wall and floor of a building, of a casing the upper part of which is sufficiently shallow from front to rear to permit it to be contained within such wall and the lower part of which is extended forwardly beyond the upper part to make it considerably deeper from front to rear than the latter, the said upper part of the casing being set into said wall and the lower part being sunk through the floor to a level at which the forward extension lies just below the floor and between the joists, a tunnel extending underneath the floor from said casing, an inlet through the floor into the tunnel at a point remote from said wall, air conditioning means in the said upper part of the casing, and blower means housed in the said lower part of the casing and adapted to draw air from the tunnel and drive it up past the said air conditioning means.

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